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ABSTRACT

This study examined the effect of two computer literacy courses (one was offered online, and the other was offered through traditional methods) at the Middle East Technical University (Turkey). The two courses were compared in terms of their effectiveness on computer attitudes of student-teachers. The study also explored the other factors that contributed to changes in attitudes of the student teachers. The study used data from 209 (147 female, 62 male) student-teachers, of whom 69 attended the online course and 140 attended the traditional computer literacy course. Findings indicated that there is a combined effect of gender, computer literacy course type, whether any computer-related course was taken before, previous computer attitude, and possession of home computer on student-teachers' post-attitude towards computers. Follow-up study results also supported the results related to student-teachers' perceptions about the computer literacy course they attended. (Contains 11 references.) (Author/MES)

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A Comparison of Student-Teachers' Attitudes Toward Computers in On-Line And Traditional Computer Literacy Courses: A Case Study

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Abstract: This study examined the effect of two computer literacy courses (one was offered as on-line and the other one was offered through traditional methods). Two courses were compared in terms of their effectiveness on computer attitude of the student-teachers. This study also explored the other factors that contributed to changes in attitudes of the student-teachers. The study used data from 209 (147 female, 62 male) student-teachers of which 69 of them attended to the on-line computer literacy course, and 140 of them attended to the traditional computer literacy course. Findings indicate that there is a combined effect of gender, computer literacy course type (traditional vs. on-line), whether any computer related course taken before, previous computer attitude and possession of home computer on student-teachers' post-attitude toward computers. The follow-up study results were also supportive to the results of statistical analysis, and they investigated student teachers' perceptions about the computer literacy course they attended.

Introduction

One of the most dramatic changes in the last three decades has been the rapid development in technology, which has gradually found its way not only into business and industry but also into the classroom through computers and computer-related technologies. Many jobs in the 21st century will involve computers in some way, and members of the workforce who are not able to use them will be at a disadvantage. Therefore, it is critical for individuals to have the necessary education and skills to compete in the next information-intense century.

With the lower cost, wide usage, and increased capabilities of computers, the use of computers in education has grown rapidly. As computers became more widely available and used in schools, educators have adopted many different ways to use them. More importantly, educators have started questioning the meaning of "computer literacy". One of the basic definitions of "computer literacy" is the idea that there should be some basic familiarity with computers which all students need in order to compete in the job market, or to be well-educated citizens. The need for students to cope with daily problems in a dynamic world has led many educators to conclude that having microcomputers in education enriches the learning environment (Bitter, 1985; Fredricson, 1984; Pea and Kurland, 1984).

The new "Information Age" has brought new concepts and technologies for learning and education such as Internet, on-line learning, on-line education and some new technologies provided by development of the Internet. Today, on-line learning holds promises for both distance education and conventional learning environments. Nowadays, it is not surprising to see on-line courses and even the creation of 'virtual universities' based on the web. These circumstances led to the evolution of the idea that today each individual must become computer literate; must know how to deal with computers. Knowing how to use computers today is like learning how to read and write. Society imposes a great demand on teachers to prepare their children for the information era.

When the computer is considered as an educational tool, the most important thing is the role of the teacher. Many researchers suggests that if computers are to be integrated into education, then teachers need to be trained in computer use (Duckett and Wallet, 1994, Savenye *et.al* 1992). For computers to be used in the classroom, teachers must have necessary knowledge about computers. Because of this fact, pre-service and in-service programs for teachers and computer literacy courses for student-teachers were developed and offered. Computer literacy has been defined in many different ways because of the changes in computer technology. It is

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recognized that the definition of computer literacy will be specific to the context in which the computer-literate individual must function. A certified public accountant, a doctor, an academician, and a secretary will all need different skills and knowledge to be comfortable and effective in their interaction with computers; each will need something different to become computer literate. This also applies to students and teachers. The interplay of many factors may be involved in the determination of computer literacy such as cognitive styles, mental models, prior experience, age and gender. As Randhawa and Hunt (1984) emphasized, all computer literacy programs must take into account the developmental and cognitive readiness of the learners. Curricula must be based upon the expected entry behaviors and characteristics of the students for optimal instructional impact (Woodrow, 1990).

The idea of integrating computer literacy courses into pre-service teacher education programs goes as far back as to the extension of basic education from 5 to 8 years in 1997 in Turkey. At present, the Ministry of National Education in Turkey is in the process of redesigning curricula and furnishing all basic education schools with Instructional Technology (IT) rooms. This reform has direct implications for teacher training institutions. For example, from 1998 onwards, a computer literacy course became a must course for all student-teachers to fulfill the requirements for teaching credential. Accordingly, all schools of education in Turkey have started offering computer literacy courses for their student-teachers to fulfill this requirement. The earlier attempts at preparing student-teachers to use computer technologies have been initialized by a few higher education institutions. One of these institutions is the Middle East Technical University.

The computer literacy course SCE300 "Computer Applications in Education" has been offered by traditional methods since 1994 at Middle East Technical University (METU), School of Education. This course is carried out through class sessions and laboratory sessions. The basic concepts and knowledge are introduced through class sessions in an electronic classrooms and applications are done through laboratory sessions in the computer laboratories.

Due to the need to provide computer literacy for students whose number has been increasing dramatically in the preparatory school at METU, the on-line computer literacy course IS100 "Introduction to Information Technology and Applications" was also added to the curricula in 1998. This course is designed to introduce basic computer skills, use of common computer applications and fundamentals of programming languages for computer literacy. To serve this goal, a few computer rooms were equipped around the campus with the application software by which learners are exposed to content and they can practice basic computer skills.

Offering an on-line computer literacy course has evoked another question for educators and administrators: which method is more effective to facilitate computer literacy? It is inevitable that reaching a rigid answer to this question will result from a number of studies concerning all the variables that influence efficiency. Even though the on-line computer literacy course is a new experience for the university, it is important to conduct early studies even considering a limited number of variables to understand the effectiveness of the new course. Such studies will yield a better allocation of scarce sources for pre-service teacher education.

The Study

The main purpose of this study is to investigate the effect of two computer literacy courses at METU (one is offered as on-line and the other is by traditional methods). These two courses are also compared in terms of their effectiveness on computer attitudes of the student-teachers with different demographics such as gender, whether any computer-related courses taken before, previous computer attitude and possession of home computer. The second purpose of the study is to explore the other factors that contributed to changes in attitudes of the student-teachers at METU.

The study is based upon a pretest-posttest none-experimental design and a follow-up qualitative study. Since there were no control group in the study it was not possible to conclude that the computer literacy course type was the prior factor that affect the attitude toward computer. There would be a possibility for the other factors affecting the attitude. Therefore, an additional follow-up qualitative study designed to survey student's perceptions about the treatment (computer literacy course), and "computer literacy" concept also to explore the other factors possibly affected participants' attitude toward computer.

There are five independent variables (gender, whether any computer-related courses taken previously, possession of home computer, the computer literacy course type, pre-attitude) and one dependent variable (Post Attitude) in the study.

The study used data from 209 (147 female, 62 male) student-teachers of which 69 of them attended to the on-line computer literacy course, and 140 of them attended the traditional computer literacy course.

To obtain relevant data for the variables, the questionnaire packet used for the pre-test which contained the "Computer Attitude Scale (CAS)" and a "Computer Competency Questionnaire (CCQ)". The Computer Attitude Scale was also used with a follow-up questionnaire as the post-test.

The Computer Attitude Scale(CAS) was originally developed by Loyd and Gressard (1984) and then, translated into Turkish and analyzed by Berberoglu and Calikoglu (1992). The CAS is a likert-type instrument consisting of 40 items. In CAS, there are four sub-scales: 1) computer anxiety or fear of computers, 2) liking of computers, 3) confidence in ability to use or learn about computers, 4) and usefulness (importance) of computers in life. Each sub-scale has 10 items and the items are rated on a Likert-type scale ranged from 1 (strongly disagree) to 4 (strongly agree). In the study the reliability coefficients for the Computer Attitude Scale (CAS) were obtained as 0.91 for pre-test and 0.93 for the post-test.

The Computer Competency Questionnaire was developed by the researcher to survey demographics of student-teachers. The CCQ included 14 items in the form of fill in the blank and alternative-response type questions in order to collect relevant data about demographics of the student. The CCQ focused on the following information: Gender, department name, the computer related courses taken previously, the programming languages that are known, previous computer experience, the places had computer access, purpose of computer use, possession of home computer, will on having a computer, interest of computer, confidence on success from the course.

The follow-up questionnaire was developed and distributed by the researcher to 124 (68 from on-line group, 56 from traditional group) student-teachers agreed to participate. The follow-up study included 9 open ended questions focused on the following areas:

1. Student's expectations from the course, and effectiveness of the course in terms of satisfying their expectations.
2. Effectiveness of the course in terms of its helping student-teachers to develop positive attitudes toward computers.
3. Excluding this course itself, the other factors that student-teachers believe contributed to the changes in their attitudes toward computers.
4. Effectiveness of teaching activities applied in the class that student-teachers believe most helped their learning about computers.
5. Effectiveness of the course in terms of student-teachers' professional development.
6. Student's perception of the definition of a computer literate person.
7. Student's perception of the qualification of the course itself as a computer literacy course based on
8. Student's self-evaluation on being computer literate after participating in the course.
9. Student's self-evaluation on being an efficient computer user on the basis of their skills and knowledge gained through the course.

Data collection and analysis

At the first class meetings, after a brief introduction to the class by the instructor, the researcher was introduced to the student-teachers. The volunteered student-teachers were asked to participate in the study and were given time to complete the CCQ to collect information about the participant and CAS to measure the participant's attitude toward computers before taking the course. At the end of the semester; CAS was distributed once again to measure the participants' attitude toward computer after taking the course and student-teachers were asked to participate in a follow-up study. The CAS and CCQ results were analyzed by using SPSS. The follow-up study results were analyzed by qualitative analysis methods.

The demographic information obtained was analyzed by using frequency distribution. Based on this information, an insight to the data was provided. Multiple Regression was performed to analyze effect of pre-attitude scale scores, type of course (traditional vs. on-line), gender, whether any computer related courses taken before, and possession of home computer on posttest attitude scores of student-teachers.

Results

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Means and standard deviations of the pre and post-attitude scale scores and the frequency of males, females, whether the computer-related courses taken previously or not, and possession of home computer for the sample are presented in Table 1. The mean of the pre-attitude scale scores is higher than the post-attitude scale scores for on-line group. This indicated that the on-line computer literacy course does not have any effects on improving the student-teachers' attitudes toward computers. On the other hand, in traditional group, compared to pre-attitude scale scores, the post-attitude scale scores were higher, even though the difference was not significant. This indicated that the traditional computer literacy course has a mild effect on improving student-teachers' attitudes toward computers.

	Pre-test		Post-test		Gender		Computer related courses taken or not		Home computer	
	X	SD	X	SD	Male	Female	Yes	No	Yes	No
Traditional	131.59	14.67	131.93	21.53	41	99	27	113	20	120
On-line	131.86	17.02	126.71	17.95	21	48	14	55	10	59

Table 1. The summary of observed variables

Results of Multiple Regression Analysis (table 2) indicated that there is a combined effect of gender, computer literacy course type (traditional vs on-line), whether any computer related course taken before, previous computer attitude and possession of home computer on student-teachers' post-attitude toward computers.

	B	Std.Error	Beta	T	Sig.
Gender	4.282	2.704	0.096	1.583	0.115
Courses taken previously	3.380	3.129	0.066	1.080	0.281
Possession of home computer	-1.486	3.632	-0.025	-0.409	0.683
Computer literacy course type	5.474	2.615	0.126	2.093	0.038
Pre-attitude scale scores	0.668	0.082	0.503	8.135	0.000

Table 2. Multiple Regression Analysis

Analysis of the responses to each question in the follow-up study indicated as follows:

The responses to first sub-question demonstrated that prior computer experience and knowledge shaped student-teachers' expectations of the course.

The results for the responses to the second sub-question were different for two groups; majority of student-teachers in traditional group believed the course itself contributed to the changes in their attitudes toward computers even though those student-teachers who already had prior computer experience admitted that this contribution was supplemental since they always had positive views for computers in education. On the other hand, the results indicated that majority of student-teachers in on-line group believed that the course was not very effective on their attitudes. This is delineated by the given responses expressing the problems they were faced with. The student-teachers who attended the course IS 100 had difficulty with the level of English used in the program and also with on-line learning itself. They expressed that they were not ready for on-line learning and felt the lack of human support in the course. However, the majority of the participants from both groups reported that the course help them slightly to develop positive attitudes.

The responses to third sub-question verified that the most important factor for student-teachers that they believed affected their computer attitudes apart from the course was the necessity and the widespread use of computers. They felt that as a teacher they also had to be computer literate and help their students with their endeavors. Analysis of the responses also indicated that possession of home computer increased teachers' access to computers and willingness to learn more about them. Finally, given the fact that pre-service teachers were also students working on their teaching credential, they felt computers provided a great asset to them in their own education and thus, it helped them develop positive attitudes toward computers.

Current research suggests that computer literacy courses somehow affect attitudes toward computers by increasing computer experience of participants. However, the literature fails to explore which teaching activities are most effective in enhancing students' computer experience and developing their attitudes. The

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fourth question, therefore, was asked to determine which were the most effective teaching activities that teachers believe helped them learn more about computers and gain positive attitudes. The findings supported the view that laboratory sessions and office applications, using Internet, preparation of homework and projects in SCE 300 were most effective teaching activities for the student-teachers. This conclusion is also consistent with the results of the study (Gurbuz, Eryilmaz and Bulut, 1999). In addition to these activities, on-line quizzes and exams were signified as effective factors by the student-teachers attended the on-line course, thus it confirmed the effective potential of the exams on learning.

The responses to fifth sub-question showed that the more new skills students gained from the course, the more they valued the course, and thus the more the course contributed to their professional development. Interestingly, regardless of their previous experience with computers, the student-teachers believed that a follow-up computer course would contribute more to their professional development. Finally, in both on-line and traditional group, some respondents agreed that the course was useful, but some of them reported that the course was not satisfactory. This finding paralleled with the results of the multiple regression analysis which indicated that after completing the course there was no combined effect of pre-attitude scale scores, gender, the computer-related courses taken previously, computer literacy course type (traditional versus on-line), and possession of home computer on the student-teachers' post-attitude.

The responses to the sixth question showed that majority of the participants in both on-line and traditional group described being computer literate as: "being an efficient computer user and being able to write programs and use different types of computers". In both on-line and traditional group, with slight differences, a computer literate person was perceived similarly: "the person who is able to know what to do with computers, to be able to use them efficiently and to have no fear of them".

The responses to the questions 7, 8, and 9 showed that Student-teachers in both on-line and traditional group pointed out that the course did not provide sufficient practice and the knowledge provided by the course was insufficient, or not up-to-date. On the other hand, some respondents monitored that the course could be considered as computer literacy course in spite of some insufficiencies pointed out. The majority of the respondents thought that the course they attended could be a beginning for them in terms of further studies on computer literacy.

Discussion

Participants argued that the course should be offered at least in two levels and then through the course, the difference between these levels should be minimized. Moreover, more laboratory session hours should be supplied since the participants emphasized the effectiveness of practicing with computer. This study indicated that basic computer literacy courses are most effective for those with no prior experience. The results also verified that in order for teachers to become fully capable of using technology in the classroom, a follow-up computer course is necessary. These conclusions are also consistent with the study (Gurbuz, Eryilmaz, Bulut, 1999).

This study contributes to a better understanding of how student-teachers' attitudes toward computers change due to the participation in a computer literacy course. The data from this study indicated that student-teachers developed somehow positive attitudes, their anxiety was lowered and confidence was increased with computers following the participation in a computer literacy course. The results of this study supported the view that participation in a computer literacy course affects pre-service and in-service teachers attitudes toward computers positively (Savenye, 1993).

It is a fact that the number of student teachers who demand technology education in their pre-service education has been increasing dramatically. Therefore, teacher education institutions should innovate and adapt new formats and medium for computer literacy courses to meet this demand. This study indicated that on-line computer literacy courses should not fail in providing face-to-face interaction and learning activities for participants. It should be recognized that learning is a social phenomenon that takes place within a social context. Therefore, it is crucial for on-line computer literacy courses to ensure this social context and provide interactivity among the participants. If face-to-face or real time communication is not available for on-line courses, then more advance technologies should be adopted to provide synchronous communication and interaction among the participants.

For traditional computer literacy courses, this study indicated that student teachers sought more up-to-date content and lab activities that parallel with their needs. Therefore, computer literacy courses offered in the traditional manner should provide lab sessions with activities that reflect student teachers' needs and up-to-date activities.

This study revealed the fact that although student teachers recognized the importance and role of technology in their lives, they failed to associate technology with their profession. Therefore, in their pre-service education, faculty members in their teaching methodology courses should demonstrate the importance and role of technology in teaching as well.

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